

The UV/VIS spectra of **16a**, representing the off-state of this 1,4-CS system and **16b**, equivalent with the on-state, have already been discussed in connection with figure 1A and 1B.

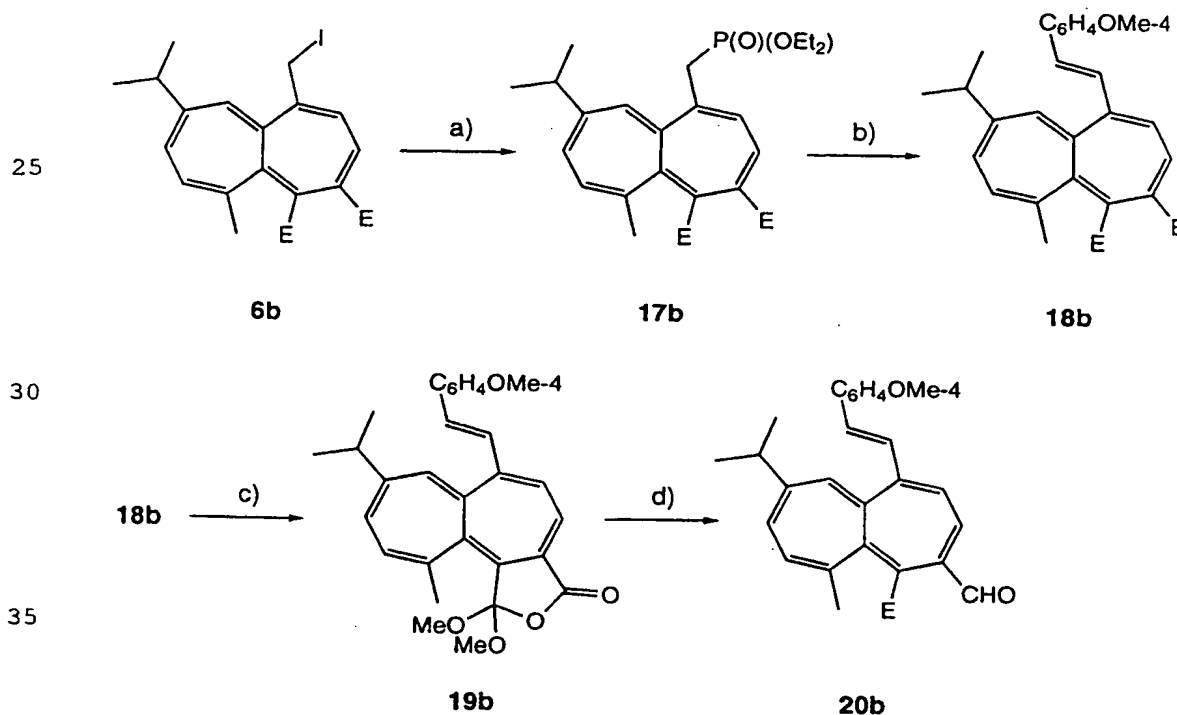
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Example 10: Preparation of methyl 6-methyl-9-iso-propyl-[1-(E)-(2-(p-methoxy)phenylethenyl)-4-(E)-4-(p-nitro)-phenyl-butandienyl]heptalene-5-carboxylate (**21a/21b**) and its DBS-isomer

An even more delocalized system containing donot-acceptor perimeter substituents in 1,4-relation, the heptalenecarboxylate **21b** carrying an [(E)-4-methoxystyryl] group at C(1) and an [(E)-4-nitrostyryl] moiety at C(4) shall be described herein. The procedure for the synthesis of **21a/21b** is shown in scheme 11.

scheme 11

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21b), 3.69 (s, MeOCO-C(1) of 21a), 3.67 (s, MeOCO-C(5) of 21b).

The UV/VIS spectra of 21a and 21b are shown in figures 2A and 2B. The habitus of the spectrum of 21a resembles very much that of 16a. However, the main absorption band of 21a at 340 nm is appreciably broader than that of 16a at 345 nm. This is chiefly due to the fact that the heptalene band II of 21a is much more intense than in 16a. Also the heptalene band I of 21a at ca. 440 nm seems to be more intense than in 16a. Moreover, an additional absorption band is recognizable in 21a sitting as a shoulder on the low-wavelength flank of the heptalene band III. A comparable band in 16a at 280 nm is much less intense. The switch of the p-bonds in 21a induces again a tremendous change in the UV/VIS spectrum of the new heptalene 21b. The most intense band appears now at 445 nm. It must have its origin in the heptalene band I and, possibly, II (vide supra). The strong absorption at 375 nm (360 nm for 16b) can be assigned to the heptalene band III, followed by a shoulder at the low-wavelength flank at ca. 330 nm which may correlate with the shoulder at ca. 300 nm of 21a.

In conclusion, the absorption difference of both 1,4-CS systems, i.e.,  $16a \rightleftharpoons 16b$  and  $21a \rightleftharpoons 21b$ , for their longest-wavelength bands at 440 and 445 nm, respectively, is with 0.03:1 approximately the same. These pronounced absorption differences are already readily noticeable in diluted solutions with the bare eye.

Example 11 : Method to prepare a rewritable compact disk comprising compounds 16a/16b as material for data storing

5           A polycarbonate disk having a diameter of 5.25 inch and a thickness of 2 mm is coated with a 0.25  $\mu\text{m}$  solid layer of 16a/16b by evaporating a mixture of 16a/16b in a high vacuum chamber onto its surface, thus affording an absorbance A at approximately 1 at 440 nm, as referred to 100% conjugative on-state. A second disk is coated by standard procedures with an  $\text{Al}_2\text{O}_3$  protected reflective aluminum layer. The two disks are bonded together with the heptalene and aluminum layers at the inside of the sandwich structure. Writing (bleaching) of the disk is performed by focusing a modulated IR-laser onto the heptalene layer while simultaneously irradiating the heated spot by light in the 430 to 550 nm range. The intensity of the IR-laser is adjusted so as to impart sufficient conformational mobility to the heptalene system 16a/16b for the photochemically induced DBS process to occur. Erasing (coloring) is achieved by irradiating a spot, which is heated as described above for increasing the mobility of the heptalene molecules being at the conjugation off-state by light having a wavelength of 350 nm or by simply recreating the 16a/16b by spotwise heating with a modulated IR-laser.

          The process is perfectly analogous for writing/erasing procedures of the traditional and well-known magneto-optical disks and similar considerations for spot size, spinning speed, guiding the write/read head, and data transfer rates apply.

          Reading of the data is achieved by focusing the light of a read laser with light in the 430 to 550 nm range of the spinning disk and registering the intensity modulation of the light reflected from the aluminum layer.

A doubling of the data density on the disk can be achieved by using two orthogonal directions of linear polarized writing light and separately detecting the reflected intensity of two orthogonal polarizations of the reading light.

Example 12 : Method to prepare a rewritable compact disk comprising compounds 21a/21b as material for data storing

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A glass disk having a diameter of 5.25 inch and a thickness of 2 mm is coated with a 0.5 mm solid layer of a  $10^{-3}$  molar solution of 21a/21b in methylene chloride, thus affording a solid layer of heptalene molecules with an absorbance A of approximately 1 at 440 nm, as referred to 100% conjugative on-state. A second disk is coated by standard procedures with an  $Al_2O_3$  protected reflective aluminum layer. The two disks are bonded together with the heptalene and aluminum layers at the inside of the sandwich structure. Writing, erasing and reading is accomplished as in example 11.

Example 13 : Method to prepare a rewritable compact disk comprising compounds 21a/21b, embedded in a methylacrylate matrix, as material for data storage

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A  $10^{-3}$  molar solution of 21a/21b in methylene chloride is prepared in a degassed two-component or light curable methylmethacrylate embedding mass. The mass is sandwiched as a 2  $\mu m$  thick layer between two 5.25 inch, 2 mm thick glass disk, with one of the disks coated with an  $Al_2O_3$  protected reflective aluminum layer turned to the inside of the sandwich structure. After the curing, writing, erasing and reading are performed as described in example 11.

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Example 14 : Method to prepare a holographic rewritable memory comprising compounds 21a/21b, as material for data storage

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A  $5 \times 10^{-3}$  molar concentration of 21a/21b is prepared in a degassed two-component or light-curable methylmethacrylate embedding mass. A volume holographic disk is prepared by coating a 3.5 inch glass disk with a  
10 100  $\mu\text{m}$  thick layer of the embedding mass containing the heptalene molecules. A spatially modulated object beam with a wavelength being at 450 nm is created in the usual manner by passing it through a liquid crystal spatial light modulator of 640 x 480 pixels, thus carrying about  
15 307'200 bits of information. Said object beam is brought to interference with a reference beam of identical wavelength of approximately 1.5 mm<sup>2</sup> on the 10  $\mu\text{m}$  layer containing the heptalene molecules. The spot is temporarily heated by an IR-laser to a temperature where photochemical  
20 interconversion of the conjugation on-state and off-state actually occurs, but not sizable thermal equilibration of the photochemically created conjugation on-state/off-state distribution. After switching off the object, reference and IR-laser beams, a holographic interference  
25 pattern is present in the form of more off-state heptalene molecules being present in zones where additives interference of the recording beams occurred than in zones where subtractive interference occurred, i.e. bleaching for light of wavelengths between  $\lambda = 400$  nm and  
30  $\lambda = 550$  nm has taken place in additive zones. The hologram can be read out in the usual manner, by generating an object beam through irradiation of the hologram with a reference beam and recording the object beam pattern with a 640 x 480 pixel containing charge coupled device.

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Several holograms are superimposed on the same location by the well-demonstrated angular multiplexing technique. After exhausting the recording potential